

## TITLE

"Machine for carrying out dyeing operations on textile materials".

\* \* \*

5

## ABSTRACT

The invention relates to a machine for dyeing textiles, comprising a structure (1) able to receive a plurality of containers or vessels (2; C) holding substances which contribute to form dyeing baths within suitable dyeing tanks (3), a plurality of dyeing tanks (3) and a plurality of material-holding baskets (4) being located at corresponding and preset positions, a motor-driven carriage (5) being associated with said structure (1) and supporting means (6; 8) for removing and subsequently delivering the substances held within said vessels (2; C); the carriage (5) supports means (7) for removing and handling said material-holding baskets (4). (Fig. 9).

\* \* \*

20

## SPECIFICATION

The present invention refers to a machine for carrying out dyeing operations on textile materials.

## BACKGROUND OF THE INVENTION

Dyeing machines are known to comprise a platform onto which more vessels are positioned in a preset order, said vessels being able to contain predetermined amounts of products which contribute to form, suitably metered, dyeing baths within suitable tanks. Inside each tank a basket is manually inserted which contains the material to be dyed, the same basket being taken out, also manually, after a preset time.

US Patent No. 6105636 describes a machine comprising a horizontal platform upon which the vessels containing the basic products and the means associated with a movable carriage located above said platform, are  
5 positioned according to a program to remove the products from said vessels and meter the same products within other containers inside which the solutions to be delivered to the dyeing tanks are formed.

The existing machines, although able to automate in  
10 part the dyeing cycle, require the intervention of an operator for completing the cycle.

#### **SUMMARY OF INVENTION**

The main object of the present invention is to eliminate or at least greatly reduce the above  
15 drawback.

This result has been achieved, according to the invention, by adopting the idea of making a machine having the characteristics disclosed in claim 1. Further characteristics being set forth in the  
20 dependent claims.

The present invention makes it possible to significantly raise the automation level of the dyeing cycle, thus releasing the operators from exacting operations, such as the loading of material-holding  
25 baskets into the dyeing tanks and, respectively, the unloading thereof from the same tanks, so as to reduce the risk related to possible errors in handling the baskets, and increase the safety and reliability of the cycle.

#### **BRIEF DESCRIPTION OF THE DRAWINGS**

30 These and other advantages and characteristics of the invention will be best understood by anyone skilled in

the art from a reading of the following description in conjunction with the attached drawings given as a practical exemplification of the invention, but not to be considered in a limitative sense, wherein:

- 5    - Fig. 1A is a schematic plan view of a machine according to the invention;
- Fig. 1B is a schematic side view of the machine of Fig. 1;
- Fig. 2 shows the carriage with the means for metering the products and the means for grasping the material-  
10    holding means;
- Fig. 3 is a schematic view in diametral section of a material-holding basket;
- Figs. 4A-4F show schematically a sequence of the  
15    operating steps relating to the loading of baskets into the tanks;
- Figs. 5A-5E show schematically a sequence of the operating steps relating to the metering of baskets within the dyeing tanks;
- 20    - Fig. 6 shows schematically a vessel with a corresponding pipette;
- Fig. 7 is a schematic view in diametral section of a tank;
- Fig. 8 is a block diagram of the programmable system  
25    for operating the machine;
- Fig. 9 shows schematically a further embodiment of the carriage (5);
- Figs. 10A-10D show schematically a sequence of steps relating to the use of the means for the removal and  
30    delivery of powdered substances.

### DETAILED DESCRIPTION OF THE INVENTION

Reduced to its basic structure, and reference being made to Figs. 1-5E of the accompanying drawings, a machine according to the invention comprises a  
5 stationary structure (1) with a platform (10) on which more vessels (2) are positioned in correspondence of preset locations, each vessel (2) being provided for containing a liquid product that contributes to form a dyeing bath, as described later on.

10 Associated with the same structure (1) are more dyeing tanks (3) also disposed in correspondence of preset locations.

Moreover, the said structure (1) exhibits an area (11) on which, in correspondence of preset locations, more  
15 material-holding baskets (4) are positioned.

According to the example shown in Fig. 1A, the vessels (2) and baskets (4) are on opposite sides with respect to the tanks (3), and the structure (1) is made of one body having a development mostly longitudinal.

20 Associated with each vessel (2) is a corresponding pipette (20), in much the same way as described in the above mentioned US. Patent No. 6105636 to which reference can be made for further details: each pipette (20) comprises a needle (21) which is to result at  
25 right angle within the liquid of the respective vessel (2), a plunger (22) allowing the liquid drawn therefrom to be delivered through the needle (21) and exhibiting a hold portion (23) with peripheral collar-like surface (24) allowing plugging the vessel when the pipette is  
30 inserted therein.

Each tank (3) may be, for example, of a type comprising a cylindrical chamber (30) wherein a material-holding

basket (4) is to be disposed. Mounted inside said chamber (30) is a blade impeller (36) driven into rotation about its longitudinal axis (coinciding with the longitudinal axis of the tank) by an electric motor (32) which is engaged to said impeller via a magnetic transmission (33, 34): the rotation of the flange (35) borne by the motor (32) and wherein the magnets (33) are positioned, is cause for the rotation of the impeller (36) located inside the chamber (30). Disposed in the base of the impeller (36) and engaged solid thereto are the magnets (34) coupled to magnets (33). The tanks are provided with electric resistors (37) able to heat the dyeing bath which forms therein, cooling chambers (38) through which water or other cooling fluid (A) is made to run, and with a section (39) for discharging the bath. Finally, disposed on each tank (3) is a lid (300) able to be moved in closing and respectively opening position by means of corresponding actuators (not shown for the sake of clarity in the figures of the attached drawings). Indicated by (31) is a bath limiter, that is, a body centrally disposed in the tank to reduce the volume available for the bath, thereby reducing the required amount thereof for use.

Each material-holding basket (4) comprises a perforated tubular body (40) on the outer surface of which the material (M) to be dyed is disposed, and on the base of which a rim (41) is formed to allow the hold thereof, as will be described later.

Acting on said structure (1) is a motor-driven carriage (5), supported by the same structure via corresponding guides (50, 51) developed parallel and across thereto,

the said carriage being associated with:

- means (6) for grasping, handling and activating the pipettes (2);

- means (7) for grasping and handling the baskets (4).

5 The said means (6) are of a type described in the US Patent No. 6105636, that is, they comprise a gripper (60) able to engage the portion (23) of the pipettes (20), an element (61) associable with the plunger (22) so as to be driven into translation upwardly (liquid  
10 suction step) or downwardly (step of delivering the liquid previously sucked up) under control of a corresponding actuator (62), and an actuator (63) with vertical axis with which a shelf (64) is connected for the support of the actuator (62), of element (61) and  
15 of gripper (60).

The said means (7) are positioned on the side opposite to carriage (5), with respect to the means (6), and comprise an actuator (70) having vertical axis and a gripper (71) associated with said actuator. The two  
20 jaws of the gripper (71) have an end portion (72) suitably shaped so as to present a step (73) on the side facing upwards to allow hooking the baskets (4) from the inside thereof, in correspondence of the rim (41).

25 The said carriage (5), being mounted on the said guides (50, 51), can be moved, by the means (6, 7) associated therewith, to any useful point of the structure (1), that is, in correspondence of any vessel (2), any tank (3) and any basket (4).

30 Described below with reference to Figs. 4A-5E of the attached drawings, is a possible operating cycle of the present machine.

The carriage (5) is moved as far as to result in correspondence of the region which receives the baskets (4), so as to dispose the gripper (71) in line with the selected basket, that is, with the basket which supports the material to be treated, after which the gripper (71) is lowered and activated to engage the selected basket (Fig. 4A); then the gripper is lifted (Fig. 4B) and the carriage (5) is moved as far as to result in correspondence of the tank (3), so as to dispose the basket engaged by the gripper (71) in line with the selected tank (4) (Fig. 4C). Thereafter, the gripper (71) is lowered, so as to dispose the basket within the stand-by tank below, and deactivated, so as to release the basket and thus lifting the same gripper (Fig. 4E) to allow closing the tank inside which, after the closing thereof, the material is subjected to the dyeing operation in the bath previously formed therein. After a preset time has elapsed, a reverse sequence of motions will draw the carriage (5) again out of the tank, that is, to a preset storage location.

As far as the formation of the dyeing bath previously formed in the tanks (3) is concerned - and wherein a corresponding amount of water is also introduced via conduits (not shown in the attached drawings) according to the programmed bath recipes - the procedure is as follows.

The carriage (5) is moved as far as to result in correspondence of the region which receives the vessels (2), so as to dispose the gripper (60) in line with the pipette (20) of the selected vessel, that is, of the vessel containing the product for the tank which is to be fed with, after which the gripper (60) is lowered to

engage the body (23) of the pipette and to allow the element (61) to be hooked to the pipette's plunger (22): the lifting of the plunger (22) for a travel of preset length determining the aspiration of a  
5 corresponding amount of liquid from the vessel (2). The gripper (60) is lifted so as to draw the pipette fully out of the vessel (2), as shown in Fig. 5A, and the carriage is moved as far as to result in correspondence of the tanks (3) so as to dispose the pipette in line  
10 with the tank which has to receive the liquid (Fig. 5B). Then the pipette is lowered (Fig. 5C) and the element (61) causes the pipette's plunger (22) to be lowered as programmed, so that the tank below will receive the preset batch of the selected liquid. Upon  
15 completion of this delivery step, the carriage (5) moves back as far as to result in correspondence of the vessel, in order to position again the pipette relative thereto (Figs. 5D, 5E) or, if so programmed, moves as far as to result in correspondence of another tank (3)  
20 to let in a preset batch of the same liquid. The carriage (5), the means (6) for taking out and metering the products, the means (7) for handling the baskets (4), the actuators for opening/closing the lids of the tanks (3), the motors (32), the resistors (37  
25 and the valves associated with the outlets (39) of the tanks, are all controlled by a programmable electronic central unit (U) provided with a memory wherein there are stored, besides the positions of each vessel (2), of each tank (3) and each basket (4), also the recipes  
30 of the baths to be formed in each of the tanks (the said recipes being in terms of, for example, amount of water, amount or batches of liquids drawn from the



vessels (2) and of tank's operating temperature). Such a programmable unit is of a type known to those skilled in the art and, will not, therefore, be described in greater details.

5 With reference to the example of Fig. 9, the said carriage (5) can also support means (8) for taking out and delivering powdered substances to be introduced, in preset batches, into the target tanks (3), according to a predetermined work program. For example, the said  
10 means (8) may be of the type described in the document IT-FI/2000/A/153 to which reference can be made for further details: the means (8) for the removal and handling of the containers (C) for solid substances are supported by a shelf-like structure (80) associated  
15 with the carriage (5), on the side opposite to said means (6). Such means (8) comprise gripper means with four jaws (81) (in the figures only two jaws being shown) activated by corresponding pneumatic actuators (82) by means of a system of levers hinged to each  
20 other and to a tubular skirt (83) borne by the shelf (80) and acting also as a support for the actuators (82). The said jaws (81), when disposed in closing condition (as shown in Figs. 10C and 10D), clamp the containers (C) selected by the program. The said skirt  
25 (83) ends up with a cylindrical bush (84) having such diameter and height as to allow the positioning thereof onto the neck of containers (C). Moreover, inside the tubular skirt (83) a shaft (85) is disposed in association with a corresponding electric motor (850)  
30 and ending with a power takeoff (86). The latter is inside the said bush (84) and allows the actuation of metering means which the containers (C) for solid

substances are provided with. The shelf (80) sustaining the gripper means (8) is engaged to a corresponding pneumatic actuator with vertical axis (87). Formed externally to said actuator (87) are straight vertical guides (800) for a guided upward and downward slide of the same shelf (80) relative to the platform of structure (1) on which the containers (C) are located at corresponding and preset positions.

The containers (C) exhibit an inner chamber (88) for containing the solid substances (for example, in the form of powders or crystals) and comprise an inner delivery device. The said delivery device comprises a vertical rod (89) passing midway across said chamber (88) and to which a scraper (890) is engaged. The free, upper end (891) of the rod (89) is suitably shaped to fit into the power takeoff (86) of the unit (8). In correspondence of the lower base of the chamber (88), the said containers (C) exhibit an outlet section for the substances held therein.

When provided by the program, the carriage (5) transfers the means (8) as far as to result in correspondence of the selected container (C) (Fig. 10), then the means (8) are lowered to determine the coupling of the power takeoff (86) of the unit (8) with the end (891) of rod the (89) located inside the container (C) (Fig. 10B), and the jaws (81) tighten on the neck of container (C) (Fig. 10C). Afterwards, the unit (8) is transferred by the carriage (5) as far as to result in correspondence of the selected tank (3) (Fig. 10D) and the motor (850) is started to determine the exit, in a preset amount, of the substances held in

the container (C), that is, the introduction of such substances into the stand-by tank (3) located below.

The construction details may vary in any equivalent way as far as the shape, dimensions, elements disposition,  
5 nature of the used materials are concerned, without nevertheless departing from the scope of the adopted solution idea and, thereby, remaining within the limits of the protection granted to the present patent.